11-6665-210-10

TM 11-6665-210-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL
RADIATION DETECTION AND ALARM
SYSTEM AN/FJW-1(V)1

Headquarters, Department of the Army, Washington 25, D.C.

30 July 1963

WARNING

SR90 or Y90

The gamma detectors in this system contain radio active material (para 5*b*(3)). The gamma detectors are potentially hazardous. Strontium 90 is primarily a beta emitter; if you are exposed to this radioactive material, see qualified medical personnel and the Safety Director.

Do not drop the gamma detector.

Do not remove the aluminum cylinder from a gamma detector that has been dropped from a tower or platform unless it is removed under the supervision of a Radiological Protection Officer.

Do not remove the Strontium 90 source from its container.

Do not remove the Strontium 90 container from the gamma detector.

Do not operate the gamma detector test circuit when the aluminum cylinder is removed from the gamma detector.

Refer all maintenance of the Strontium 90 test source to Lexington Army Depot, Lexington, Kentucky.

Refer to TB SIG 225 for Identification and Handling of Radioactive Signal Items.

Refer to TB 11-6665-210-12 for safe handling, storage, and transportation of Radiation Detection and Alarm System AN/FJW-1(V)1.

Refer to paragraph 83 for repackaging and storage of the gamma detectors.

0101.11:

READEX FICHE best copy available

NOTE:

ORGANIZATIONS USING THIS EQUIPMENT MUST BE LICENSED BY THE ATOMIC ENERGY COMMISSION (REFER TO FEDERAL REGISTER, TITLE 10, CHAPTER 1, PARTS 30, 40, AND 70).

WARNING

HIGH VOLTAGE

is used in this equipment.

DEATH ON CONTACT

may result if safety precautions are not observed.

EXTREMELY DANGEROUS VOLTAGES EXIST IN THE FOLLOWING UNITS

Detector, Thermal Radiation DT-219/FJW-1(V)	115 volts ac; 550 volts dc
Detector, Gamma Radiation DT-220/FJW-1(V)	250 volts dc
Power Supply PP-3923/FJW-1(V)	115 volts ac; 400 volts dc
Control-Indicator C-378/FJW-1(V)	115 volts ac
Control-Indicator C-3020/FJW-1(V)	115 volts ac; 125 volts dc
Test Set, Radiation Detection and Alarm System TS-1579/FJW-1(V)	115 volts ac; 400 volts dc

DON'T TAKE CHANCES!

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *13 February 1969*

Operator's Manual
RADIATION DETECTION AND ALARM SYSTEM AN/FJW-1 (V)1

TM 11-6665-210-10, 30 July 1963, is changed as follows:

Delete "nuclear" in the following places:

Page 1, paragraph 9*d*, lines 5, 10, and 13.

Page 13, paragraph 9*f*(1), line 8.

Page 15, paragraph 9*f*(2), lines 2 and 5.

Page 1, warning. Make the following changes:

Line 6. After "detector," add a period, and delete remainder of sentence.

Line 9 through 12. Delete lines 9 through 12.

Line 13. After "Lexington," add: -Blue Grass.

Line 15. Delete the sentence and substitute: Refer to TB 750-237 for information concerning the identification, handling, storage, and disposal of radioactive items in the supply system.

Line 18. Delete line 18.

Page 2, warning. Under units listed, delete "Control-Indicator C-378/FJW-1(V)" and substitute: Control-Indicator C-3781/FJW-1(V).

Page 3, paragraph 2. Delete paragraph 2 and substitute:

2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to the latest issue of DA Pam 310-7 to determine whether there are modification work orders (MWO'S) pertaining to the equipment.

Paragraph 3. Delete paragraph 3 and substitute:

3. Forms and records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army), NAVSUP Publication 378 (Navy), AFR 71-4 (Air Force), and MCO P4610-5 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF361) as prescribed in AR 55-38 (Army), NAVSUP Publication 459 (Navy), AFM 75-34 (Air Force), and MCO P4610.19 (Marine Corps).

d. Reporting of Equipment Manual Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forward direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-ME-NMP-AD, Fort Monmouth, N.J. 07703.

Page 4, paragraph 4*b*. Delete the first sentence and substitute:

Radiation Detection and Alarm System AN/FJW-1(V)1 is used to activate control and alarm circuits that perform functions such as those given below:

Subparagraph *b*(5). Delete "necessary".

Page 6, paragraph 5*b*(2), chart, incandescent lamp, line 3. Change "9.2," to: 0.92.

Subparagraph *b*(3), sensitivity. Delete and substitute:

Sensitivity	Responds to an increase in radiation level of 216 mr/hr over a time interval of 10 milliseconds

Subparagraph *b*(6). Delete subparagraph *b*(6).

Page 7, paragraph 7, chart. Make the following changes:

In "Common name" column, line 6, change "Nuclear power supply" to: Power supply cable

In item column, line 15, delete "Control assembly".

In "Common name" column, line 14, delete "Control assembly".

In item column, line 27, after "Mounting Plate Sensing Group," add: Power Supply PP-3923/FJW-1(V).

In "Common name" column, line 22' after "Mounting plate," add: Power supply.

Paragraph 8, line 6. After "indicator are," add: usually.

Subparagraph *a*, line 4. After "assembly is," add: usually.

Page 8, paragraph 9*c*(2). Delete the last sentence and substitute: The source by a mechanical shutter.

Paragraph 9*d*. Make the following changes: Title: Delete the title and substitute: *Power Supply PP-3923/FJW-2(V).*

Page 9, paragraph 9*e*, *note*, last line. Change "echelon" to: category maintenance.

Page 13, paragraph 9*j*(2), heading. Delete the heading and substitute: *Power supply cable.*

Subparagraph *j*(3), line 6. Change "the" to: a.

Subparagraph *j*(4), line 3. Change "five" to: seven.

Page 16, paragraph 10*b*. Delete the last sentence and substitute: Each signal conductor must be capable of carrying 30 milliamperes with a loss of not more than 20 volts dc (terminal voltage) between the central and slave indicators.

Page 19, paragraph 15, chart. Make the following changes:

In "During test procedures" column, line 1, delete "not used" and substitute: Light 60 seconds (approximately) apart (each for 10 seconds) to indicate operative blast detecting circuits in the system *a*.

In "During operating procedures" column, line 1, delete "1/2 to 2" and substitute: 10.

In "Control or indicator" column, lines 7 and 8, delete "(common to (A) and (B))".

In "During testing procedure" column, delete lines 10 through 13 and substitute: Lights when TEST switch (item 6) is operated and remains on until test cycle is completed (also lights if slave control test switches are operated).

In "Control or indicator"column, lines 11 and 12, delete "(common to (A) and (B))". Add the following foot note beneath the chart:

a. This feature is not incorporated in all models.

Paragraph 16. Make the following changes:

Line 7. Delete "for 1 second".

Note, line 2. Change "echelon" to: category.

Subparagraph *a*. Delete subparagraph *a* and the note following subparagraph *a* and substitute:

a. The sensing group (A) BLAST indicator will light and remain lighted for 10 seconds.

Subparagraph *c*. Delete the note following subparagraph *c*.

After subparagraph *c*, add:

c.1. The sensing group (B) BLAST indicator will light and remain lighted for 10 seconds.

Page 22, appendix I. Delete the publications listed in appendix I and substitute:

DA Pam 310-7	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
TB 750-237	U.S. Army Index of Modification Work Orders.
TM 38-750	Identification and Handling of Radioactive Items in the Army Supply System.
DA Pam 310-4	Army Equipment Record Procedures.

Page 23, section I, Dimensions column, line 4. Change "122 lg." to: 20 lg.

Section II. Delete and substitute:

Section II. RUNNING SPARES

Qty	Item
1	Cable Assembly, Power, Electrica (CX-6486/U
1	Cable Assembly, Power, Electrica (CX-9384/U
1	Cable Assembly, Power, Electrica (CX-9385/U
1	Detector, Blast, Overpressure DT-(18/FJW-1(V)
1	Detector, Gamma Radiation DT-2(0/FJW-1(V)
1	Detector, Thermal Radiation DT-2(9/FJW-1(V)
2	Diode, type 1N2071
10	Lamp, incandescent (type GE-S6)
2	Lamp, Photoflash, type S(-309
2	Rectifier, Silicon, type 5251
3	Relay (Allied Control Corp, type B(-Hro-6A)
1	Relay (Allied Control Corp, type P(OHO-6A)
1	Relay (Amperite Corp, type 115c1(0)
3	Relay (Edison Corp, 501 (Delay))
3	Relay (Sigma Corp, type 42RO 10,000-G-SIL)
1	Relay (Sigma Corp, type 5JO)
2	Tube, Electron, type OB2
1	Tube, Electron, type 1P41
2	Tube, Electron, type 2D21
2	Tube, Electron, type 6AN5
2	Tube, Electron, type 6BJ7
2	Tube, Electron, type 12AX7

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution: To be distributed in accordance with DA Form 12-50, Section I, (qty rqr block no. 5) operator maintenance requirements for the AN/FJW-1, system.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This manual describes Radiation Detection and Alarm System AN/FJW-1(V)1 (fig. 1). It includes operation and system testing, and system application.

2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. Department of the Army Pamphlet No. 310-4 is a current index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders which are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

3. Forms and Records

Note: The maintenance forms and records (*a* below) and report of damaged or improper shipment forms (*b* below) are for fifth echelon personnel.

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Comments on Manual. Forward all

comments on this publication direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, New Jersey. (DA Form 1598 (Record of Comments of Publications) DA Form 2496 (Disposition Form), or letter may be used.)

Section II. DESCRIPTION AND DATA

4. Purpose and Use

a. Purpose. Radiation Detection and Alarm System AN/FJW-1(V)1 detects characteristic thermal radiation, initial gamma radiation, and overpressure blasts caused by a nuclear weapon explosion.

b. Use. Radiation Detection and Alarm System AN/FJW-1(V)1 is used to activate control and alarm circuits that perform the following functions such as the following:

(1) Close air intake valves.
(2) Start fresh air and exhaust equipment.
(3) Stop normal water supply equipment and start auxiliary water supply equipment.
(4) Open normal power supply circuits and start auxiliary power supply equipment.
(5) Activate necessary alarms.

5. Technical Characteristics

a. System Technical Characteristics.

Type detection	Detects characteristic thermal radiation, initial gamma radiation, and overpressure blasts from a nuclear explosion.
Power requirements:	
Tower equipment	115 volts, 60 cps, 800 watts (max).
Shelter equipment	115 volts, 60 cps, 450 watts (max).
Detection range	Depends on yield of the nuclear explosion and atmospheric conditions (*b* below).
Installation:	
Distance between sensing groups within a system	1/2 mile, or 805 meters maximum. (View of terrain must be common to all detectors.)
Distance between sensing groups and control assembly	20 miles, or 32.18 kilometers (max).

b. Component Technical Characteristics.

(1) *Detector, Blast Overpressure DT-218/FJW-1(V).*

Type	Mechanical (brass-diaphragm-actuated microswitch).
Microswitch	Pin-plunger switch; actuated by 7-ounce pressure and deactuated by release of 1-ounce pressure.
Sensitivity	Responds in overpressure regions of 0.8 psi and above.

(2) *Detector, Thermal Radiation DT-219/FJW-1(V).*

Power requirements	115 volts, 60 cps, 80 watts (max).
Type of detection . .	Characteristic light pulses in the infrared region.
Maximum detection ranges:	
Clear atmosphere:	
100-kt[1] explosion	25.0 miles (40.23 kilometers).
20-kt explosion	17.5 miles (28.16 kilometers).
5-kt explosion	12.0 miles (19.31 kilometers).
Light haze:	
100-kt explosion	13.8 miles (22.20 kilometers).
20-kt explosion	10.0 miles (16.09 kilometers).
5-kt explosion	8.0 miles (12.87 kilometers).
Medium haze:	
100-kt explosion	7.5 miles (12.07 kilometers).

[1] Kiloton.

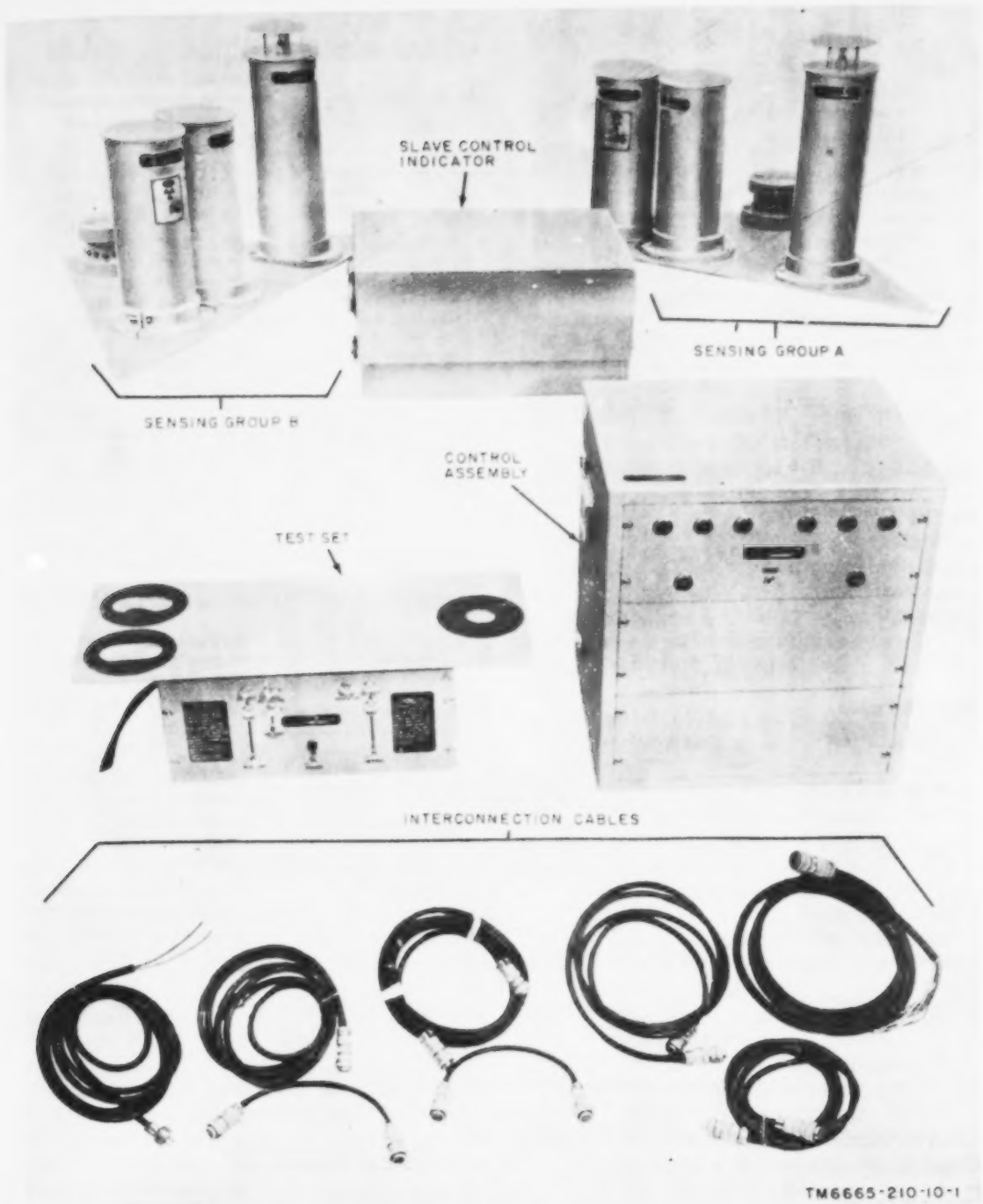

Figure 1. Radiation Detection and Alarm System AN/FJW-1(V)1.

20-kt explosion	5.6 miles (9.01 kilometers).
5-kt explosion	4.4 miles (7.08 kilometers).
Dense haze:	
100-kt explosion	4.4 miles (7.08 kilometers).
20-kt explosion	3.8 miles (6.11 kilometers).
5-kt explosion	3.1 miles (4.99 kilometers).
Test radiation source:	
Photoflash lamp	Simulates initial (fast) thermal pulse (risetime 0.02 second).
Incandescent lamp	Simulates sustained (slow) thermal pulse (risetime 9.2 second).

(3) *Detector, Gamma Radiation DT-220/FJW-1(V).*

Type	Ion chamber with electrometer circuit.
Power requirements:	
Ac	115 volts, 60 cps, 44.1 watts (max); 6.3 volts, 60 cps, 3.8 watts (max).
Dc	250 volts, 45.0 watts (max).
Sensitivity	0 to 3.6 milliroentgens per minute over a time interval of 10 milliseconds.
Maximum range:	
100-kt explosion	3.4 miles (5.47 kilometers) at peak overpressure of approximately 0.5 psi.
20-kt explosion	3.1 miles (4.99 kilometers) at peak overpressure of approximately 0.5 psi.
5-kt explosion	2.8 miles (4.51 kilometers) at peak overpressure of less than 0.5 psi.
False triggering (from cosmic ray showers)	Prevented by low sensitivity.
Test radiation source:	
Type	Radioisotope SR90 or Y90 (50 microcuries).
Exposure mechanism	Mechanical shutter, solenoid actuated.

(4) *Power Supply PP-3923/FJW-1(V).*

Power requirements	115 volts, 60 cps, 115 watts (max).
Output voltage:	
Ac	115 volts, 60 cps; 6.3 volts, 60 cps.
Dc	250 volts, regulated.

(5) *Control-Indicator C-3781/FJW-1(V).*

Power requirements	115 volts, 60 cps, 800 watts (max).
Type	Tower-mounted chassis; contains programmer, test indicators, and controls.

(6) *Control assembly.*

Type	Wall mounted; provides facilities for mounting 1 or 2 central control indicators.
Power requirements	115 volts, 60 cps, 450 watts (max), with 1 central control indicator; and 900 watts (max), with 2 central control indicators.

(a) Cabinet, Electrical Equipment CY-2697/FJW-1(V).

Type	Wall-mounted cabinet; contains facilities for 1 or 2 central control indicators.
Mounting facilities	4 mounting holes (1/4-in.) in rear door.

(b) Control-Indicator C-3020/FJW-1(V).

Type	Drawer-type chassis, contains operating controls and indicators.
Power requirements	115 volts, 60 cps, 450 watts (max).

(7) *Mounting MT-2242/FJW-1(V).*

Type	Aluminum split ring with tension screw.
Mounting facilities	Three mounting holes at base.

(8) *Mounting plate.*

Type	1/4-inch-thick aluminum plate, triangular in shape.
Mounting facilities	12 mounting holes along right-angle sides of the plate.

(9) *Test Set, Radiation Detection and Alarm System TS-1579/FJW-1(V).*

Type	Go-no-go tester.
Power requirements	115 volts, 60 cps, 440 watts (max).

6. Table of Components

The components of Radiation Detection and Alarm System AN/FJW-1(V)1 are listed in appendix II. The major components are illustrated in figure 1.

7. Common Names

Common names have been assigned to the items listed below:

Item	Common name
Radiation Detection and Alarm System AN/FJW-1(V)1.	Detection and alarm system.
Cable Assembly, Power, Electrical CX-6487/U.	Power Cable.
Cable assembly, Power, Electrical CX-9385/U.	Slave control indicator main cable.
Cable assembly, Power, Electrical CX-6486/U.	Nuclear power supply cable.
Cable assembly, Power, Electrical CX-6486/U.	Thermal detector cable.
Cable assembly, Power, Electrical CX-9384/U.	Gamma detector cable.
Control-Indicator, C-3781/FJW-1(V).	Slave control indicator.
Control assembly	Control assembly.
Cabinet, Electrical Equipment CY-2697/FJW-1(V).	Control cabinet.
Control-Indicator C-3020/FJW-1(V).	Central control indi-indicator.
Detector, Gamma Radiation DT-220/FJW-1(V).	Gamma detector.
Detector, Blast Overpressure DT-218/FJW-1(V).	Blast detector.
Detector, Thermal Radiation DT-219/FJW-1(V).	Thermal detector.
Mounting MT-2242/FJW-1(V)	Mounting clamp.
Mounting Plate, Sensing Group	Mounting plate.
Test Set, Radiation Detection and Alarm System TS-1579/FJW-1(V).	Test set.

8. System Description (fig. 1)

The detection and alarm system consists of two sensing (detecting) groups, a slave control indicator, a control assembly, interconnecting cables, and a test set. The sensing groups and the slave control indicator are mounted on towers or platforms. The two sensing groups may be mounted on separate towers, but they must be within line of sight of each other (maximum separation of one-half mile).

a. The two sensing groups are connected to a common slave control indicator (para 9*e*) which is connected to a control assembly (para 9*f*). The control assembly is located in an underground room or shelter.

b. Each sensing group consists of the following:

(1) Blast detector (para 9*a*).
(2) Thermal detector (para 9*b*).
(3) Gamma detector (para 9*c*).
(4) Nuclear power supply (para 9*d*).
(5) Mounting plate (para 9*h*).
(6) Three mounting clamps (para 9*g*).

9. Component Description

a. Blast Detector (fig. 2). The blast detector is capable of detecting blast overpressure caused by the explosion of a nuclear weapon. The blast detector contains a blast overpressure detecting element (brass diaphragm and miniature microswitch) which is housed in an aluminum container. The blast detector cable is permanently secured to the blast detector by a feedthrough cable connector (not shown). The aluminum container is secured to the mounting plate (*h* below) by three mounting bolts and nuts.

b. Thermal Detector (fig. 3). The thermal detector is composed of two functional parts, a detector ((1) below) and a simulator ((2) below). The simulator and detector are mounted on a common chassis and are housed in a common aluminum cylinder with a connector at the bottom. The thermal detector is secured to the mounting plate (*h* below) with a mounting clamp (*g* below).

(1) *Detector.* The detector is capable of detecting characteristic thermal radiation released by the explosion of a nuclear weapon. The detecting elements are a fresnel rod (light conductor), and infrared filter, and a light sensitive tube. The fresnel rod protrudes through the top of the aluminum cylinder, but the light-sensitive tube, infrared filter, and the chassis are within the aluminum cylinder, directly below the fresnel rod. A glass globe and a protective cap shield the fresnel rod from the elements.

(2) *Simulator.* The simulator provides a characteristic thermal pulse to test the detector without removing it from the system. The thermal pulse-emitting components are a photoflash lamp and an incandescent lamp. The lamps are mounted next to the fresnel rod but do not protrude through the top of the aluminum cylinder.

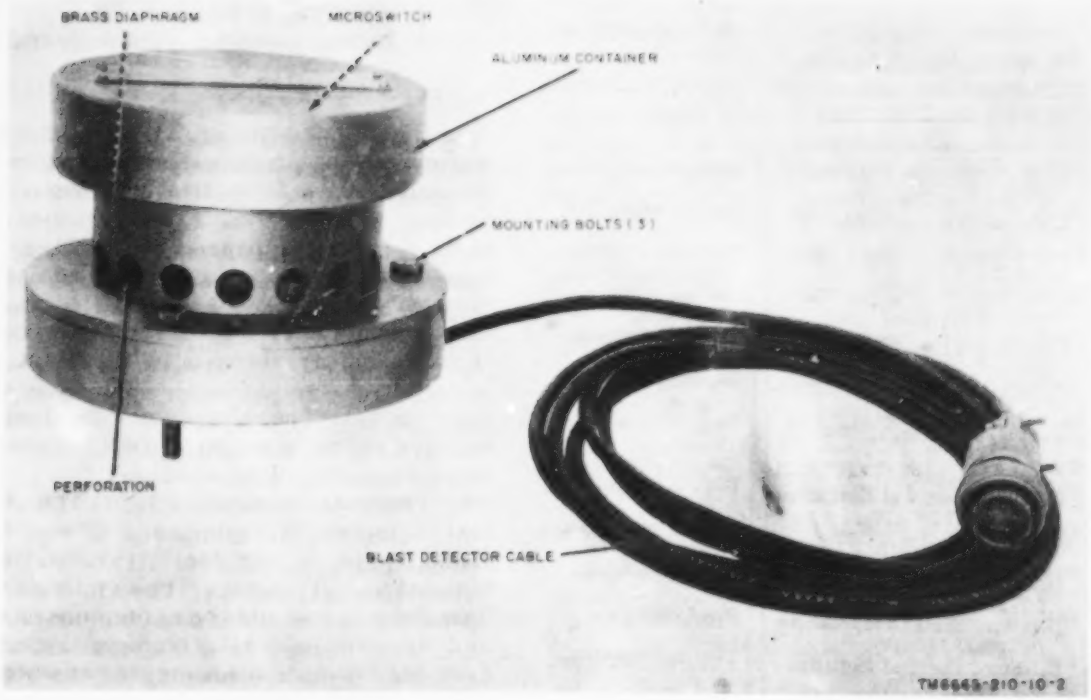

Figure 2. Blast detector.

c. Gamma Detector (fig. 4). The gamma detector is composed of two functional parts, a detector ((1) below) and a simulator ((2) below). The detector and the simulator are mounted on a common chassis and are housed in a common aluminum cylinder with a connector at the bottom. The gamma detector is secured to the mounting plate with a mounting clamp.

(1) *Detector.* The detector is capable of detecting initial gamma radiation emanating from a nuclear explosion. The detecting element is an ion chamber. The ion chamber is located at the top of the aluminum cylinder, and the chassis directly below.

(2) *Simulator.* The simulator provides a pulse of radiation to test the detector without removing it from the system. The radiation source is 50 microcuries of strontium-90 or yttrium-90. The source is mounted above the chamber and is exposed to the chamber by a mechanical shutter.

d. Nuclear Power Supply (fig. 5). A nuclear power supply, mounted on a chassis and housed in an aluminum cylinder, is installed with each sensing group. The nuclear power supply furnishes the required direct-current (dc) and alternating-current (ac) voltages for operation of the gamma detector through connectors located on the bottom of the aluminum cylinder. The nuclear power supply is mounted on a mounting plate next to the gamma detector. A mounting clamp is used to secure the nuclear power supply to the mounting plate.

e. Slave Control Indicator (fig. 6). The slave control indicator is housed in an aluminum case. The case cover shields the front panel, the chassis, and the cable connectors from the elements. The slave control indicator contains the programmer test circuits and the control circuits. The

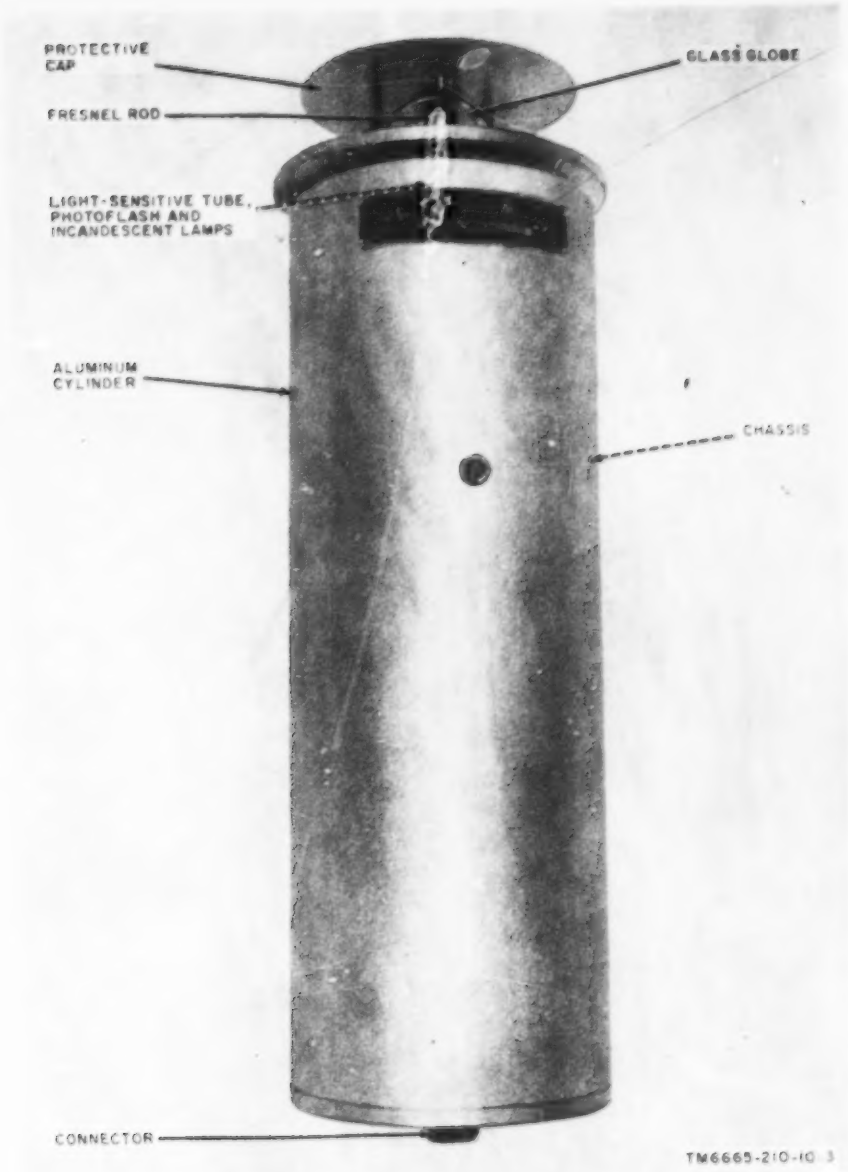

Figure 3. Thermal detector.

slave control indicator is mounted on the tower with the sensing groups.

Note: All controls and indicators located on the front panel of the slave control indicator are for higher echelon use only.

f. Control Assembly (fig. 7). The control assembly consists of a control cabinet ((1) below) and one or two central control indicators ((2) below). The control assembly is mounted on a wall or partition in an underground room or shelter.

(1) *Control cabinet* (fig. 8). The control cabinet is an aluminum rack with provisions for accommodating two central control indicators ((2) below). The control cabinet has a hinged door at the rear. Holes are provided in the bottom of the rear

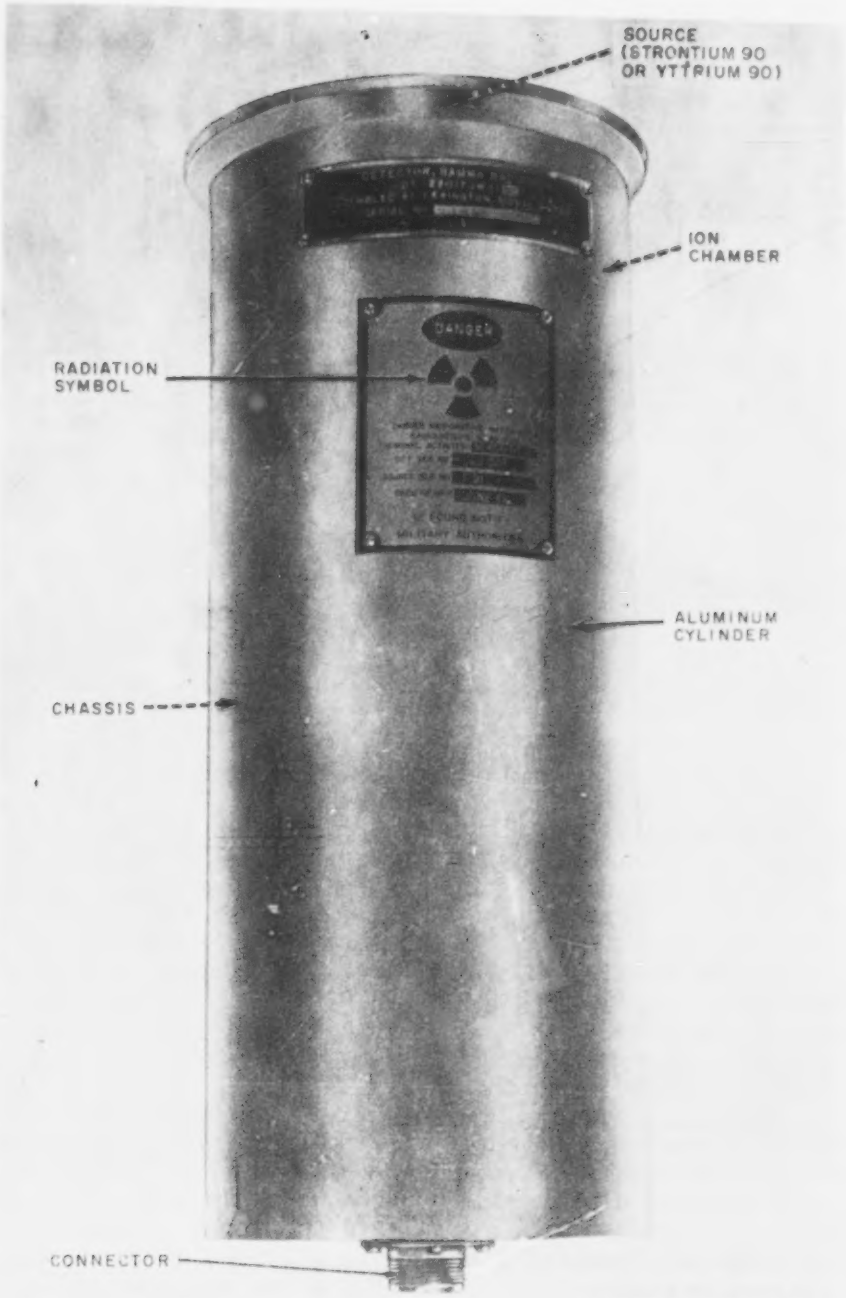

Figure 4. Gamma detector.

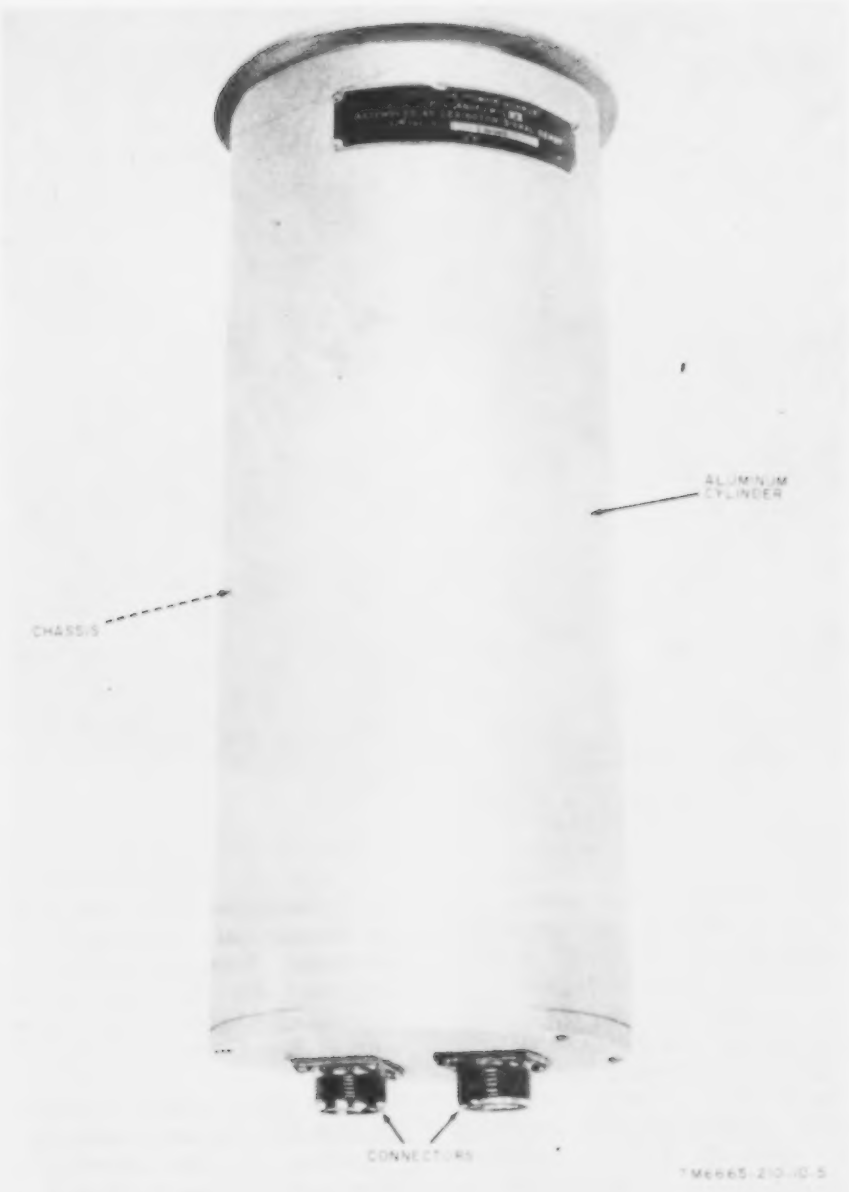

Figure 5. Nuclear power supply.

door for entrance of power and signal cables into the control cabinet. Power and signal connections are made to terminal boards mounted on the inside of the rear door.

(2) *Central control indicator* (fig. 9). The central control indicator is a drawer-type chassis with a front panel. Electrical connections are made through a connector (P101) at the rear of the chassis. The

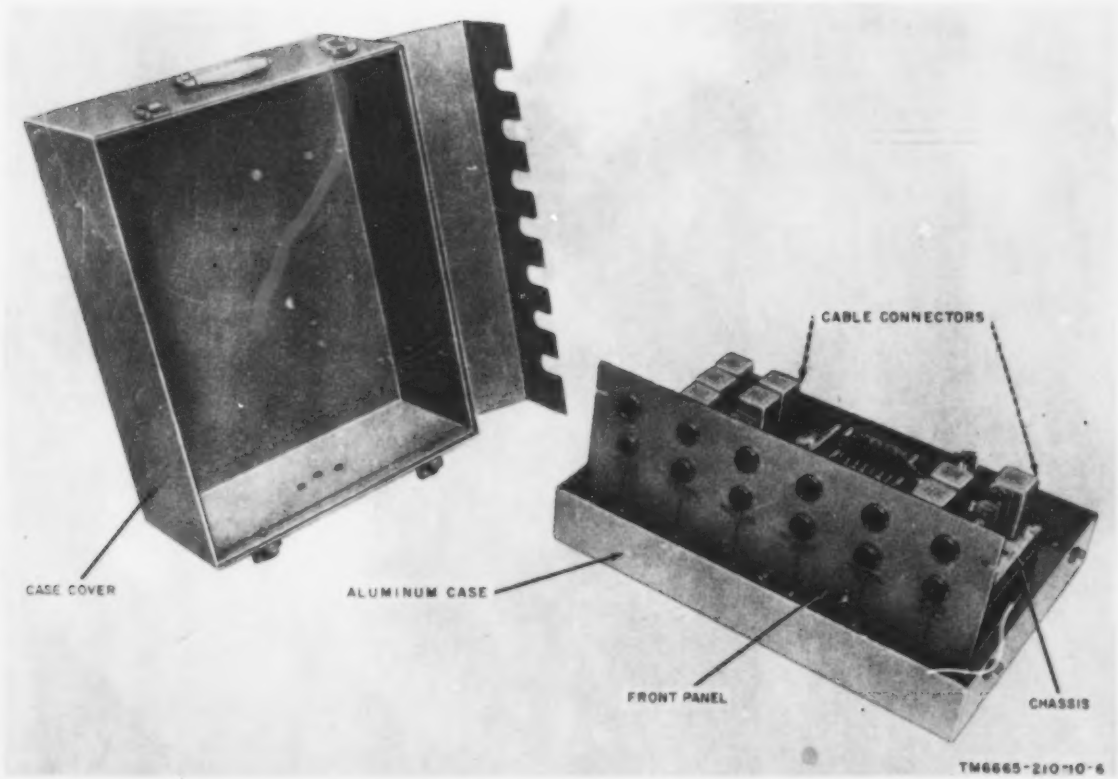

Figure 6. Slave control indicator.

central control indicator contains the display and control relays, the indicators, and the TEST switch for operating and testing the system.

g. Mounting Clamp (fig. 10). The mounting clamps are used to secure the thermal detector, the gamma detector, and the nuclear power supply to the mounting plate. Each mounting clamp is provided with three mounting holes to secure the clamp in place, and a tension screw to secure the clamp to the component being mounted.

h. Mounting Plate (fig. 11). The mounting plate is a triangular-shaped aluminum plate used to mount a sensing group. The mounting plate has four large perforations, one to accommodate each of the components (*a* through *d* above). The mounting plate has 12 plate-mounting holes along its right angle sides, permitting the plate to be securely fastened to the tower or platform. Nine mounting holes are also provided for securing the mounting clamps, and three mounting holes for securing the blast detector to the mounting plate.

i. Test Set (fig. 12). The test set is used to test the thermal detector, the gamma detector, and the nuclear power supply. The test set has a drawer-type chassis with a front panel, and a cover. The front panel contains all the controls and indicators, and the chassis contains the necessary relays and components necessary for testing. The cover houses the test set chassis and also provides a top plate for mounting the equipment under test. Condensed operating instructions are contained on the front panel.

j. Interconnection Cables (fig. 13).

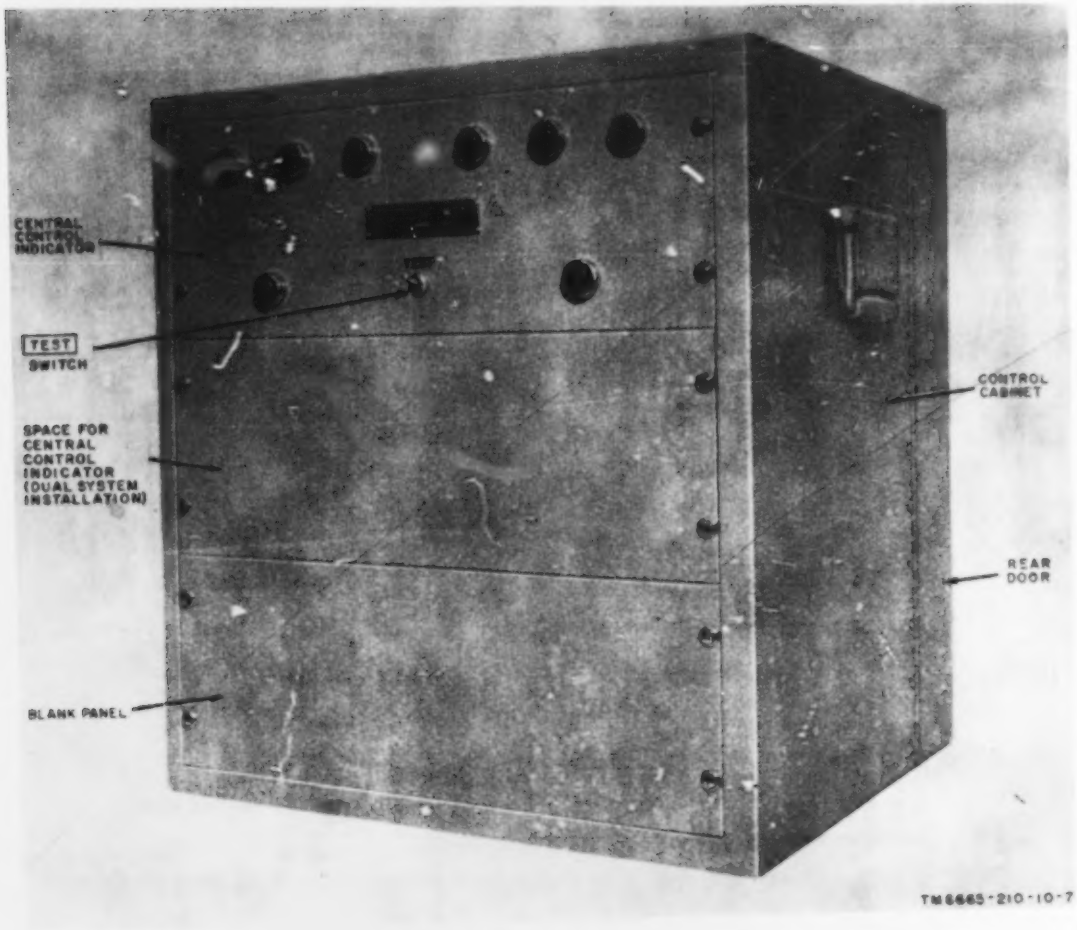

Figure 7. Control assembly, front view.

Eight cables are provided for interconnecting the system components ((1) through (5) below).

(1) *Thermal detector cable* (A, fig. 13). The thermal detector cable is a five-conductor cable 122 inches long and used to connect the thermal detector to the slave control indicator. The thermal detector cable is interchangeable with the nuclear power supply cable ((2) below).

(2) *Nuclear power supply cable* (B, fig. 13). The nuclear power supply cable is a five-conductor cable 122 inches long and used to connect the nuclear power supply to the slave control indicator.

(3) *Slave control indicator main cable* (C, fig. 13). The slave control indicator main cable is a twelve-conductor cable 122 inches long and used to connect the slave control indicator to the junction box.

(4) *Gamma detector cable* (D, fig. 13). The gamma detector cable is a five-conductor cable 20 inches long and used to connect the gamma detector to the nuclear power supply.

(5) *Power cable* (E, fig. 13). The power cable is a two-conductor cable 122

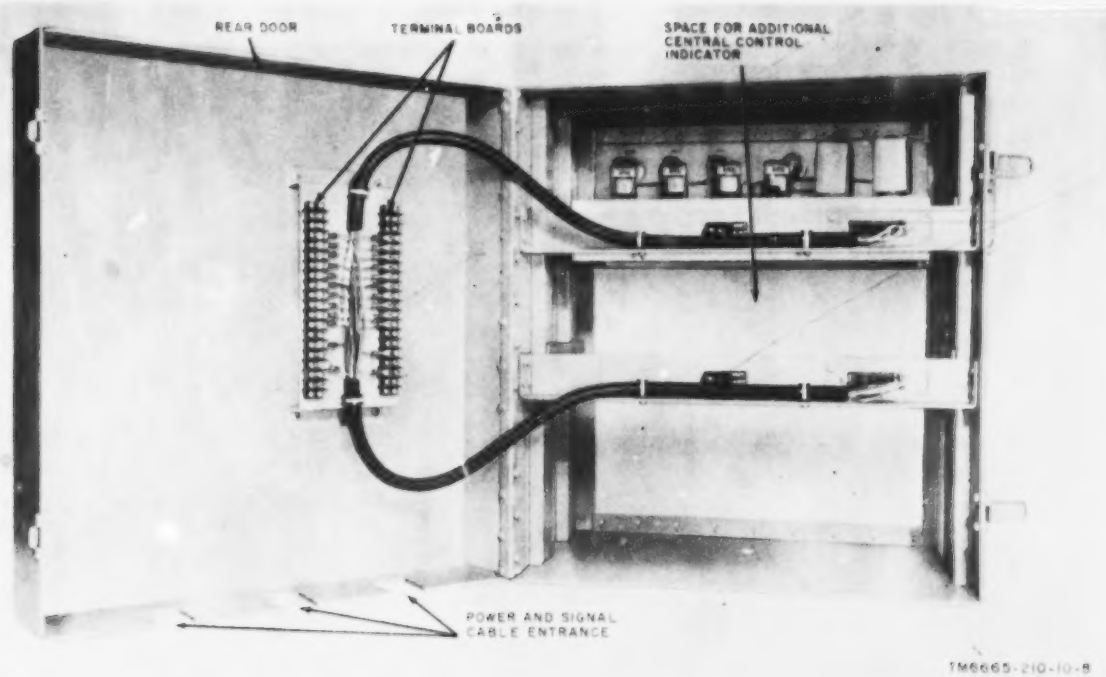

Figure 8. Control assembly, rear view.

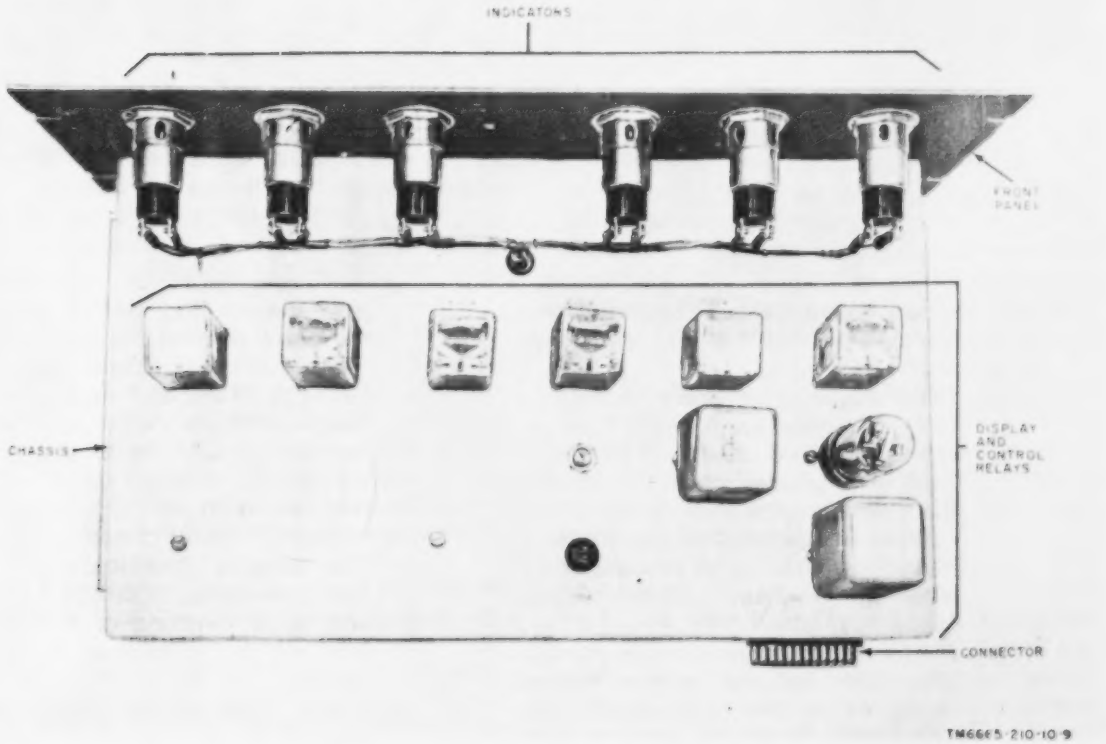

Figure 9. Central control indicator.

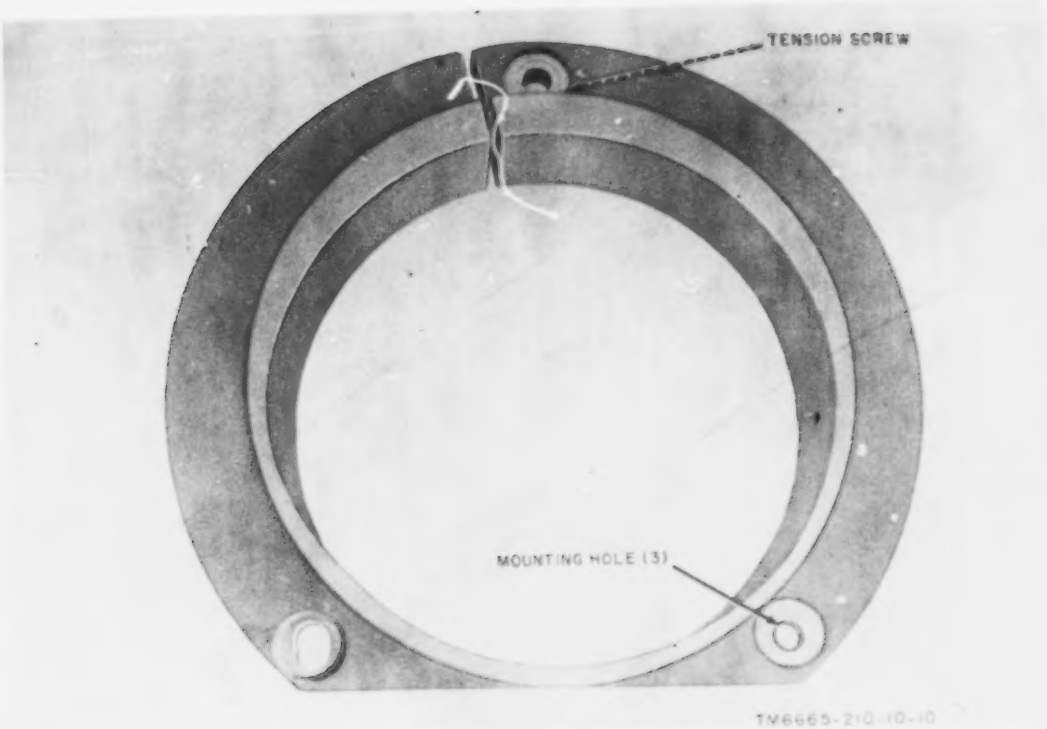

Figure 10. Mounting clamp.

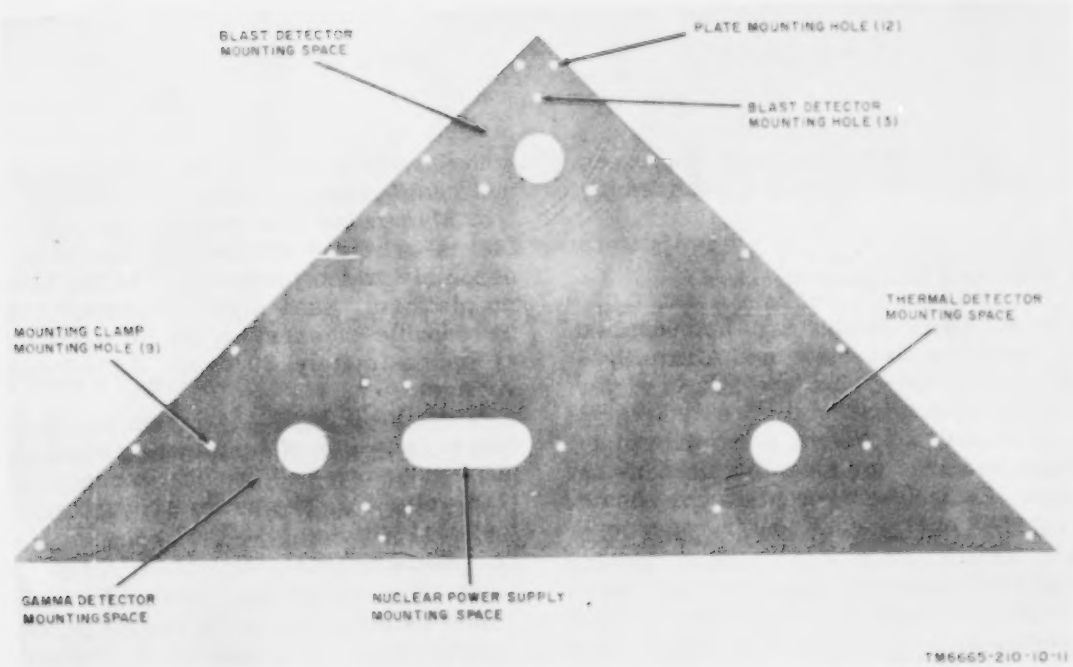
BLAST DETECTOR MOUNTING SPACE
PLATE MOUNTING HOLE (12)
BLAST DETECTOR MOUNTING HOLE (5)
THERMAL DETECTOR MOUNTING SPACE
MOUNTING CLAMP MOUNTING HOLE (9)
GAMMA DETECTOR MOUNTING SPACE
NUCLEAR POWER SUPPLY MOUNTING SPACE
TM6665-210-10-11

Figure 11. Mounting plate.

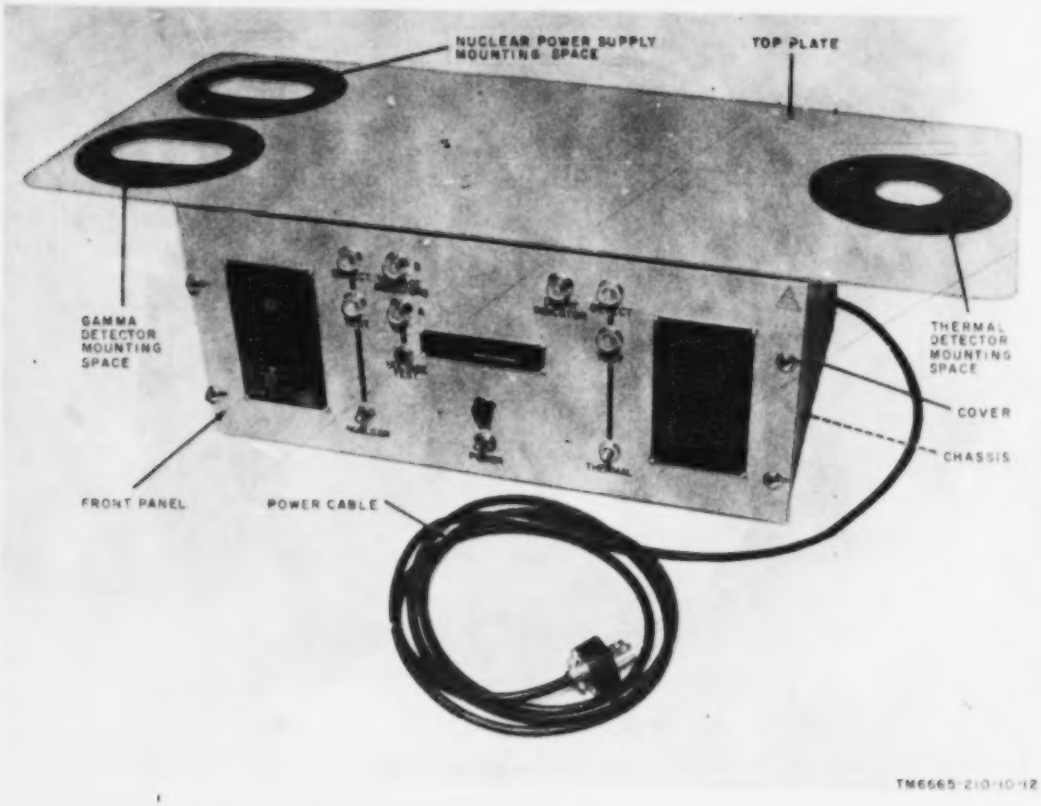

Figure 12. Test set.

inches long and used to connect ac power to the control assembly.

10. Additional Equipment Required

The following items are not supplied with Radiation Detection and Alarm System AN/FJW-1(V) but are required for use in the system.

a. Tower or Platform. A tower or platform is required for mounting the sensing groups. Each tower or platform should be constructed by local construction personnel as required for the particular site and installation.

b. Main cable. An eight-conductor cable is required to connect the control assembly to the junction box on the tower or platform. Each signal conductor must be capable of carrying 30 milliamperes at approximately 20 volts dc (terminal voltage).

c. Junction Box. A junction box is required, capable of terminating eight signal conductors and two power conductors (115 volts ac). The power conductors are installed with the junction box.

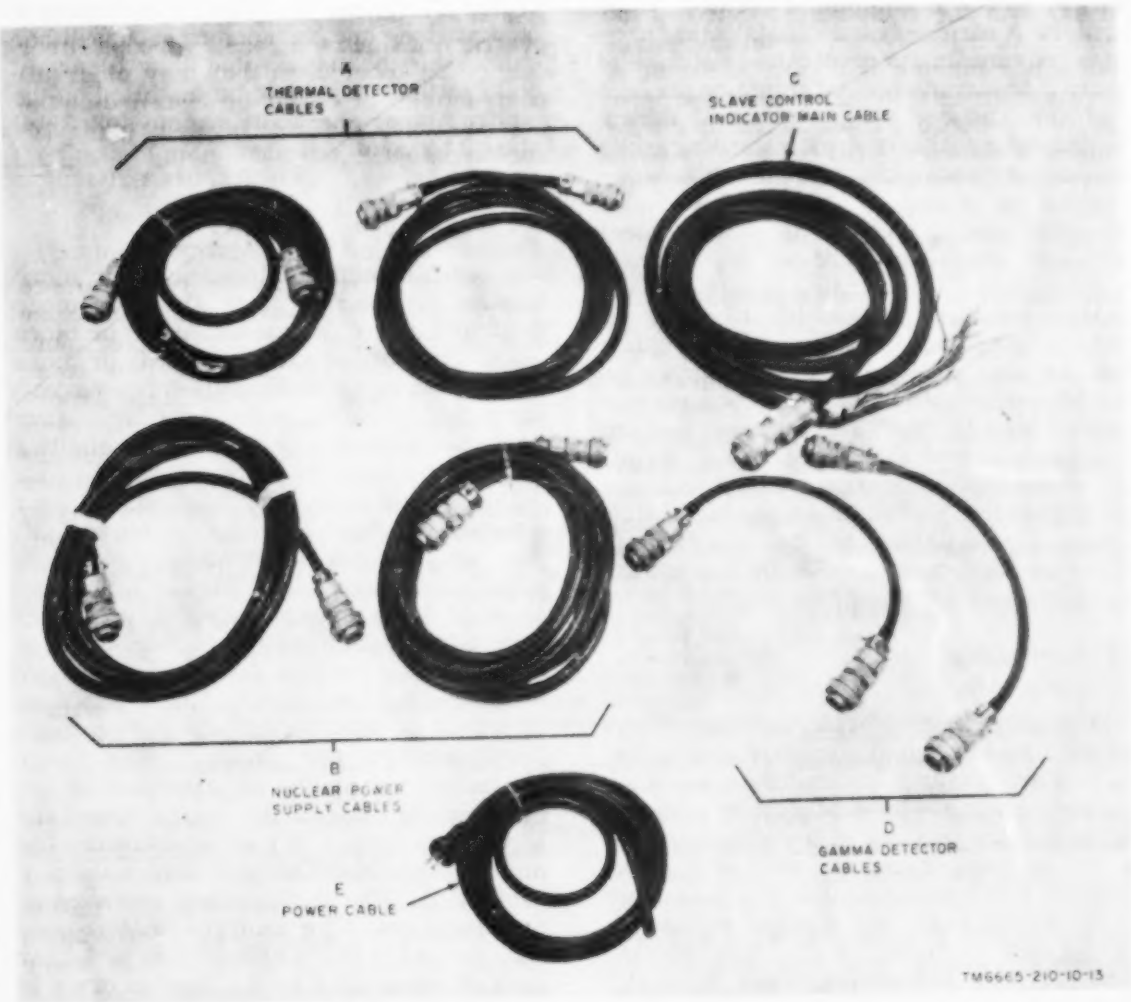

Figure 13. Interconnection cables.

Section III. SYSTEM APPLICATION

11. System Planning

Three basic system configurations are available to the user: single system (para 12), dual system (para 13), and multisystem (para 14). The system configuration used is based on a number of factors, such as the maximum area to be surveyed, the type of terrain, and the minimum area to be surveyed during inclement weather. Paragraph 5 (technical characteristics) and paragraphs 12, 13, and 14 (system configurations) provide the necessary information required to determine which configuration will meet the user's need.

12. Single System (fig. 15)

A single system (fig. 1) includes a control assembly, a slave control indicator, and two sensing groups. The single-system installation is capable of surveying an almost circular area of approximately 1,963 square miles (maximum). The radius of the circular area is 25

miles, with the equipment located at the center. A single-system installation provies only minimum protection, because of terrain obstructions that might be present and the reduced ranges (para 5) during inclement weather. A typical sensing group surveillance pattern for single-system operation is shown in A, figure 15. The 25-mile radius shown is under ideal weather conditions without any terrain obstructions. The sensing groups are installed as high as possible to clear all obstructions (artificial or natural). Since the sensing group detectors operate on the line-of-sight principle, an obstruction would change the surveillance pattern similarly to that shown in B and C, figure 15. If the sensing groups cannot be located so that they clear obstructions, or if they cannot be installed on the obstruction, the dual system (para 13) or the multisystem (para 14) should be used.

13. Dual System
(fig. 16)

A dual system includes a control assembly with two central control indicators, two slave control indicators, and four sensing groups. The dual system surveillance pattern is in the shape of the numeral 8 and covers a maximum area of approximately 3,715 square miles. For maximum area of coverage, the shelter equipment is located 20 miles from, and midway between, both tower equipments. The dual-system installation provides better protection than the single-system installation. The dual system can compensate for a single obstruction and, in inclement weather, has a larger area of coverage than the single system. A typical surveillance pattern for a dual-system installation is shown in A, figure 16. The surveillance area indicated is under ideal weather conditions and without any terrain obstructions. When terrain obstructions are present and the sensing groups cannot clear the obstructions, the sensing groups must be moved closer together to compensate for the obstructions. This reduces the total area of surveillance. Typical dual-system surveillance patterns involving small or large obstructions are shown in B and C, figure 16. If there are multiple obstructions and the sensing groups either cannot be located so that they clear all obstructions or cannot be installed on the obstructions, the multisystem (para 14) should be used.

14. Multisystem
(fig. 17)

A multisystem includes two or more control assemblies with three or more central control indicators, three or more slave control indicators, and six or more sensing groups. The surveillance pattern for a typical multisystem installation (four systems, including two control assemblies with four central control indicators, four slave control indicators, and eight sensing groups) is the shape of a cloverleaf. The maximum area of coverage for the cloverleaf surveillance pattern is approximately 5,475 square miles. In a cloverleaf surveillance pattern, the shelter equipment is located in the center of two 40-mile-long intersecting lines. The lines intersect at their midpoints and are perpendicular to one another. The tower equipment is placed at each end of the intersecting lines, 20 miles from the shelter equipment at the intersection. The multisystem installation provides the best protection. The multisystem installation can compensate for multiple obstructions and, in inclement weather, has a larger area of coverage than the single- or dual-system installations. A typical multisystem (cloverleaf) surveillance pattern is shown in A, figure 17. The surveillance area indicated is under ideal weather conditions and without any terrain obstructions. When multiple obstructions are present and the cloverleaf surveillance pattern must be distorted to compensate by moving the tower equipment, a reduction in the area of coverage will occur. If the cloverleaf pattern can be maintained while compensating for the obstructions, the multisystem can maintain its large area of coverage. A typical cloverleaf (four-system) surveillance pattern and compensation for multiple obstructions is shown in B, figure 17.

CHAPTER 2
OPERATING INSTRUCTIONS

15. Central Control Indicator, Controls and Indicators (fig. 14)

The letter (A) or (B) after the control or indicator in the following chart designates the sensing group with which the item is associated.

Item No.	Control or indicator	Function	
		During testing procedures	During operating procedures
1	BLAST indicator (A) and BLAST indicator (B).	Not used ----------	Light simultaneously for 1/2 to 2 seconds to indicate detection of overpressure blast by the system.
2	THERMAL indicator (A) and THERMAL indicator (B).	Light 60 seconds apart (each for 10 seconds) to indicate operative thermal detecting circuits in the system.	Light simultaneously for 10 seconds to indicate detection of thermal pulses by the system.
3	NUCLEAR indicator (A) and NUCLEAR indicator (B).	Light 60 seconds apart (each for 10 seconds) to indicate operative nuclear detecting circuits in the system.	Light simultaneously for 10 seconds to indicate detection of initial gamma radiation pulses by the system.
4	TEST indicator (common to (A) and (B)).	Lights when TEST switch (item 6) is operated. (Also lights if slave control indicator test switches are operated.)	Not used.
5	POWER ON indicator (common to (A) and (B)).	Lights to indicate power applied to system.	Lights to indicate power applied to system.
6	TEST switch (common to (A) and (B)).	Double-pole double-throw, spring-loaded switch; starts testing program in slave control indicator.	Not used.

16. Operation and System Testing

The detection and alarm system is placed in operation when installed. The only operational procedure performed by the operator is system testing using the central control indicator and should be performed once a day. To test the detection and alarm system press the TEST switch for 1 second and release it. The following indication should be observed.

Note: If the following indications are not observed, higher echelon maintenance is required.

a. The TEST indicator will light and remain lighted for the duration of the test.

Note: The sensing group (A) BLAST indicator will not light because no test facility has been provided for testing the blast-detection circuit.

b. The sensing group (A) NUCLEAR indicator will light and remain lighted for 10 seconds.

c. After the sensing group (A) NUCLEAR indicator turns off, the sensing group (A) THERMAL indicator will light and remain lighted for 10 seconds.

Note: The sensing group (B) BLAST indicator will not light because no test facility has been provided for testing the blast-detection circuit.

d. After the sensing group (A) THERMAL indicator turns off, the sensing group (B) NUCLEAR indicator will light and remain lighted for 10 seconds.

e. After the sensing group (B) NUCLEAR indicator turns off, the sensing group (B) THERMAL indicator will light and remain lighted for 10 seconds.

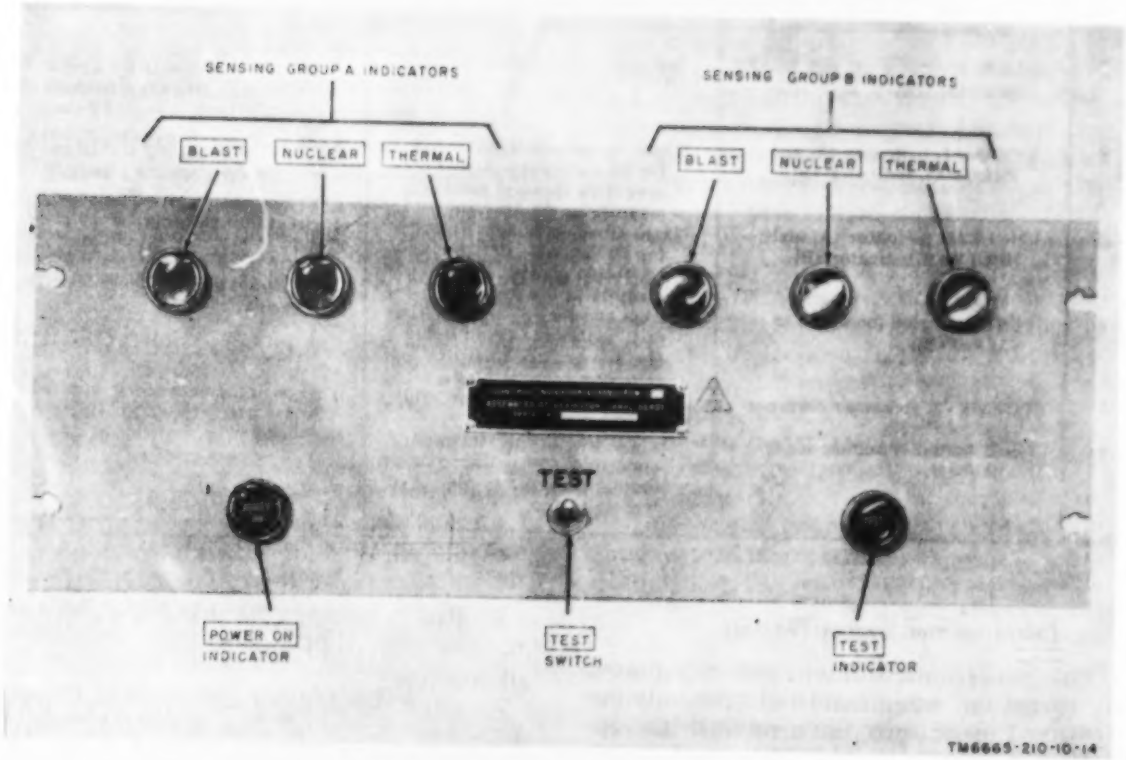

Figure 14. Central control indicator, controls and indicators.

CHAPTER 3

DEMOLITION TO PREVENT ENEMY USE

17. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 18 will be used to prevent further use of the equipment.

18. Methods of Destruction

a. If complete destruction of the equipment cannot be accomplished in the available time, destroy the following components in the order given:

(1) Control assembly.
(2) Slave control indicator.
(3) Gamma detectors.
(4) Thermal detectors.
(5) Blast detectors.
(6) Nuclear power supply.
(7) Test set.
(8) All other components and towers.

b. Use any of the following methods:

(1) *Smash.* Smash the controls, tubes, relays, transformers, and connectors; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.

(2) *Cut.* Cut the interconnecting cables and the power cables; use axes, handaxes, or machetes.

(3) *Burn.* Burn the cords, cables, manuals, and records; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

Warning: **Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.**

(4) *Explode.* If explosives are necessary, use firearms, grenades, or TNT.

APPENDIX I

REFERENCES

The following publications contain applicable information available to the operator of Radiation Detection and Alarm System AN/FJW-1(V).

DA Pamphlet 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 38-750	The Army Equipment Record System and Procedures.

APPENDIX II

COMPONENTS OF RADIATION DETECTION AND ALARM SYSTEM AN/FJW-1(V)1

Section I. COMPONENTS

Quantity	Item	Dimensions (in.)
1	Cable Assembly, Power, Electrical CX-6487/U (fig. 13)	122 lg
1	Cable Assembly, Power, Electrical CX-9385/U	122 lg
4	Cable Assembly, Power, Electrical CX-6486/U	122 lg
2	Cable Assembly, Power, Electrical CX-9384/U	122 lg
1	Cabinet, Electrical Equipment CY-2697/FJW-1(V) (fig. 7 and 8)	23.2 x 22.3 x 19.4
1	Control-Indicator C-3020/FJW-1(V) (fig. 7 and 14)	19.1 x 11.8 x 7.1
1	Control-Indicator C-3781/FJW-1(V) (fig. 6)	42.7 x 19.6 x 10
2	Detector, Blast Overpressure DT-218/FJW-1(V) (fig. 2)	4.1 x 6 dia
2	Detector, Gamma Radiation DT-220/FJW-1(V) (fig. 4)	14.2 x 6 dia
2	Detector, Thermal Radiation DT-219/FJW-1(V) (fig. 3)	22.4 x 6 dia
6	Mounting MT-2242/FJW-1(V) (fig. 10)	8.2 (od) x 5.6 (id) x 3.5
2	Mounting plate, sensing group (triangular) (fig. 11)	42.6 x 30.2 x 30.2
2	Power Supply PP-3923/FJW-1(V) (fig. 5)	14.2 x 6 dia
1	Test Set, Radiation Detection and Alarm system TS-1579/FJW-1(V) (fig. 12)	30.1 x 15.4 x 8.2
1	Set of running spares (Section II below)	

Section II. RUNNING SPARES

Quantity	Item
1	Cable Assembly, Power, Electrical CX-6486/U
1	Cable Assembly, Power, Electrical CX-9384/U
1	Cable Assembly, Power, Electrical CX-9385/U
1	Detector, Gamma Radiation DT-220/FJW-1(V).
1	Detector, Blast Overpressure DT-218/FJW-1(V).
1	Detector, Thermal Radiation DT-219/FJW-1(V).
6	Lamp, incandescent (Type GE-S6 clear).
3	Lamp, photoflash (Sylvania SA309).
1	Power Supply PP-3923/FJW-1(V).
3	Relay (Edison Model type 501)
3	Relay (Sigma 42 RO 10,000-G-Sil)
3	Relay (Allied Control Corp No. PDHO-6A)
2	Tube, gas, type No. OB2
2	Tube, electron, type No. 2D21
2	Tube, electron, type No. 5Y3
2	Tube, electron, type No. 6BJ7
2	Tube, electron, type No. 12AT7
2	Tube, electron, type No. 12AX7

GLOSSARY

Blast wave –A pressure pulse of air, accompanied by winds propagated continuously from an explosion.

Gamma radiation (or rays)–Electromagnetic radiations of high level energy originating in the atomic nuclei and accompanying most nuclear reactions, such as fission, radioactivity, and neutron capture. Physically, gamma rays are the same as X-rays of high energy, the difference being that X-rays do not originate in the nuclei.

Initial nuclear (gamma) radiation –Nuclear radiation emitted from the ball of fire and from the cloud column during the first minute after a nuclear explosion. The time limit is arbitrarily set as that required for the source of radiation to attain such a height that only insignificant amounts reach the surface of the earth.

Kiloton (kt) energy –The energy of a nuclear explosion, the equivalent to that produced by an explosion of a kiloton (1,000 tons) of TNT (10^{12} calories or 4.2×10^{19} ergs).

Nuclear weapon (or bomb) –A general name given to any weapon in which the explosion results from the energy released by reactions involving the atomic nuclei, either fission or fusion or both.

Overpressure –The transient pressure, usually expressed in pounds per square inch, exceeding the ambient pressure, manifested in the shock (or blast) wave from an explosion.

Rarefaction –Periodic decreases in air pressure resulting from sound waves.

Characteristic thermal radiation –Electromagnetic radiation (emitted in two pulses; a fast pulse and a sustained pulse) from the ball of fire as a consequence of very high temperature; it consists essentially of ultraviolet, visible, and infrared radiations. In the early stages (fast pulse), when the temperature of the fireball is very high, the ultraviolet radiation predominates, in the later stages (sustained pulse), the temperature of the fireball is lower and most of the radiation lies in the visible and infrared regions of the spectrum.

Yield–The energy released in the detonation of a nuclear weapon. Usually measured in terms of the kilotons or megatons of TNT required to produce the same energy release.

Charts Transposed to

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Sig Dep (OS) (12)
Sig Sec, GENDEP (5)
Army Dep (2) except
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  Lexington (14)
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  Tobyhanna (12)
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USA Trans Tml Comd (1)
Army Tml (1)
POE (1)
USAOSA (1)
AMS (1)
WRAMC (1)
AFIP (1)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
USA Elct Mat Agcy (12)
Chicago Proc Dist (1)
USARCARIB Sig Agcy (1)
Sig Fld Maint Shop (3)
Units org under fol TOE
  (2 cy ea UNOINDC)
  11-7
  11-16
  11-57
  11-97
  11-98
  11-117
  11-155
  11-157
  11-500 AA-AC (4)
  11-557
  11-587
  11-592
  11-597

NG: State AG (3).
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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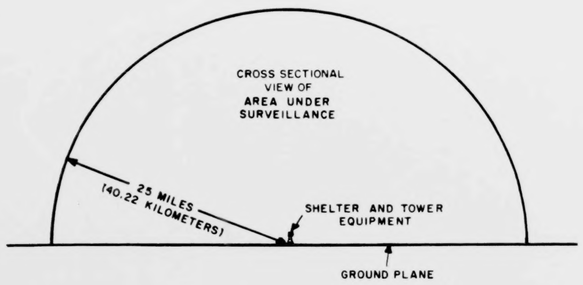

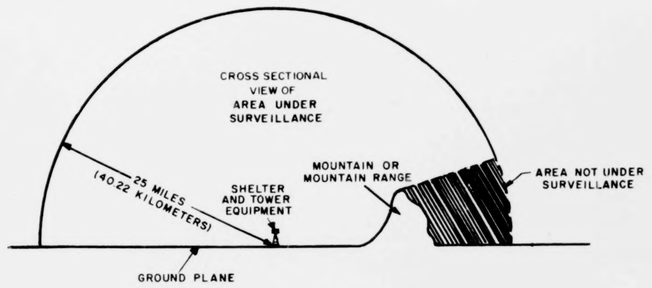

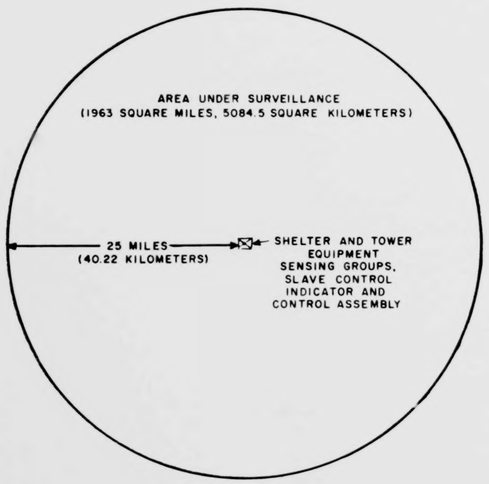

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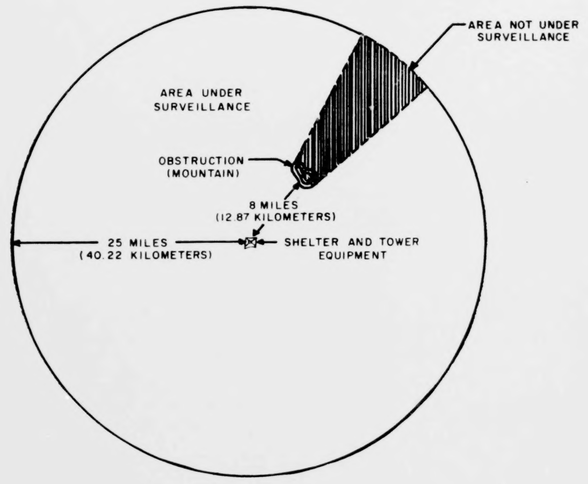

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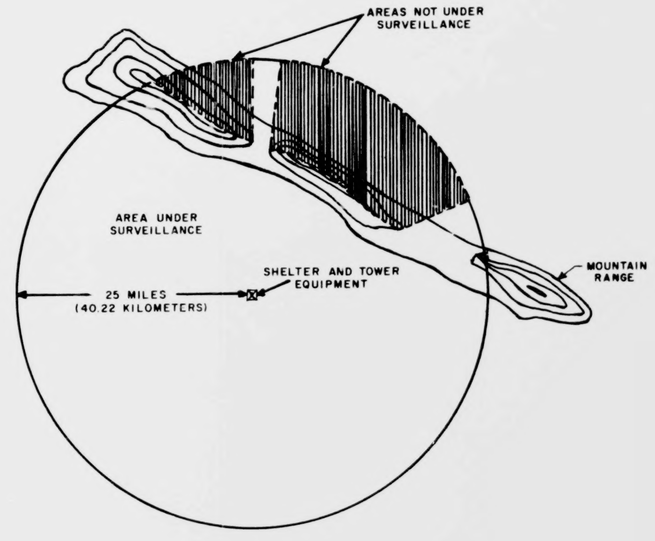

C. LARGE OBSTRUCTION IN SURVEILLANCE PATTERN.

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Figure 15. Single-system diagram (system planning).

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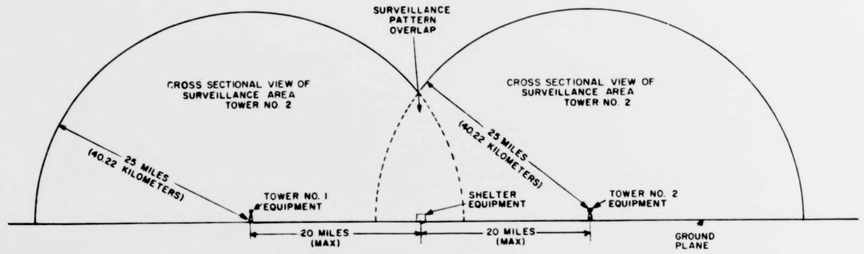
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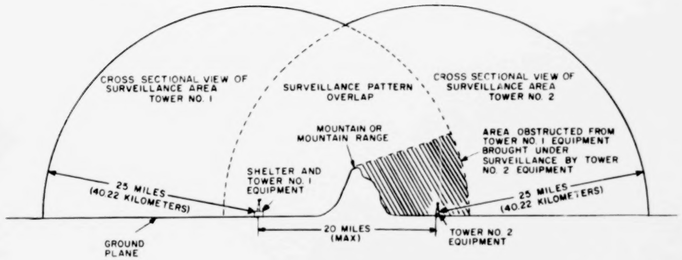
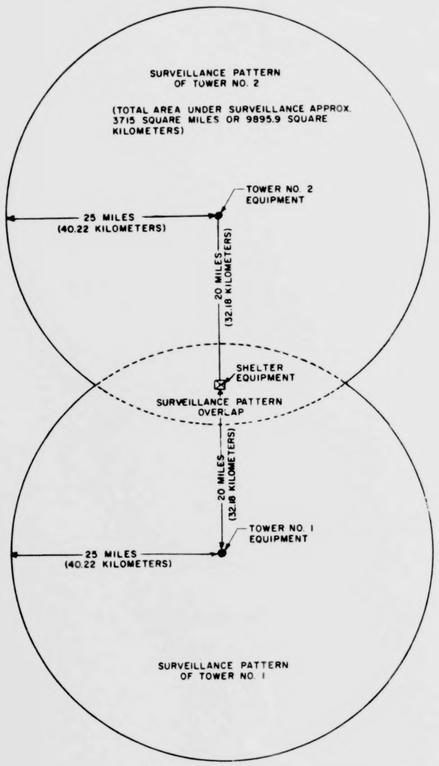
25 MILES (40.22 KILOMETERS)
TOWER NO. 1 EQUIPMENT
SHELTER EQUIPMENT
TOWER NO. 2 EQUIPMENT
20 MILES (MAX)
20 MILES (MAX)
GROUND PLANE


CROSS SECTIONAL VIEW OF SURVEILLANCE AREA TOWER NO. 1
SURVEILLANCE PATTERN OVERLAP
CROSS SECTIONAL VIEW OF SURVEILLANCE AREA TOWER NO. 2
MOUNTAIN OR MOUNTAIN RANGE
AREA OBSTRUCTED FROM TOWER NO. 1 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 2 EQUIPMENT
SHELTER AND TOWER NO. 1 EQUIPMENT
25 MILES (40.22 KILOMETERS)
25 MILES (40.22 KILOMETERS)
GROUND PLANE
20 MILES (MAX)
TOWER NO. 2 EQUIPMENT


SURVEILLANCE PATTERN OF TOWER NO. 2
(TOTAL AREA UNDER SURVEILLANCE APPROX. 3715 SQUARE MILES OR 9895.9 SQUARE KILOMETERS)
TOWER NO. 2 EQUIPMENT
25 MILES (40.22 KILOMETERS)
20 MILES (32.18 KILOMETERS)
SHELTER EQUIPMENT
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20 MILES (32.18 KILOMETERS)
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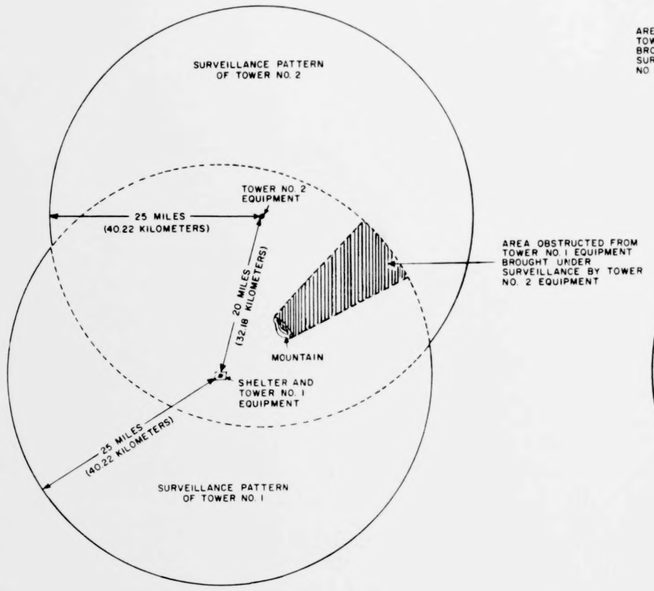
SURVEILLANCE PATTERN OF TOWER NO. 1

A. UNOBSTRUCTED SURVEILLANCE PATTERN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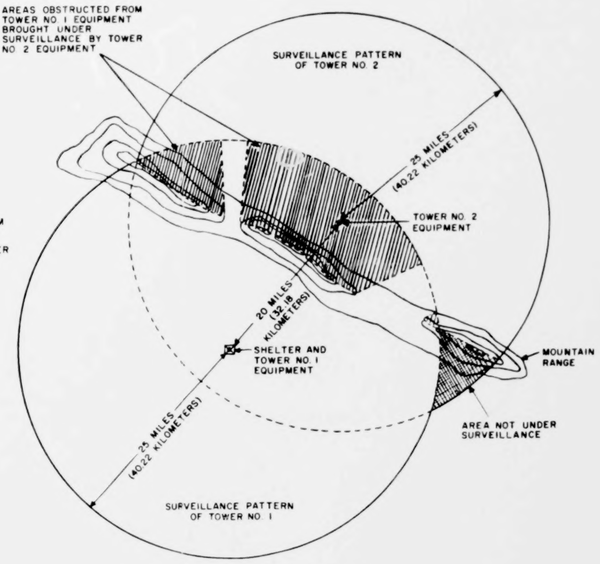
20 MILES (32.18 KILOMETERS)
AREA OBSTRUCTED FROM TOWER NO. 1 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 2 EQUIPMENT
MOUNTAIN
SHELTER AND TOWER NO. 1 EQUIPMENT
25 MILES (40.22 KILOMETERS)
SURVEILLANCE PATTERN OF TOWER NO. 1

B. SMALL OBSTRUCTION IN SURVEILLANCE PATTERN


AREAS OBSTRUCTED FROM TOWER NO. 1 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 2 EQUIPMENT
SURVEILLANCE PATTERN OF TOWER NO. 2
25 MILES (40.22 KILOMETERS)
TOWER NO. 2 EQUIPMENT
20 MILES (32.18 KILOMETERS)
SHELTER AND TOWER NO. 1 EQUIPMENT
MOUNTAIN RANGE
AREA NOT UNDER SURVEILLANCE
25 MILES (40.22 KILOMETERS)
SURVEILLANCE PATTERN OF TOWER NO. 1

C. LARGE OBSTRUCTION IN SURVEILLANCE PATTERN

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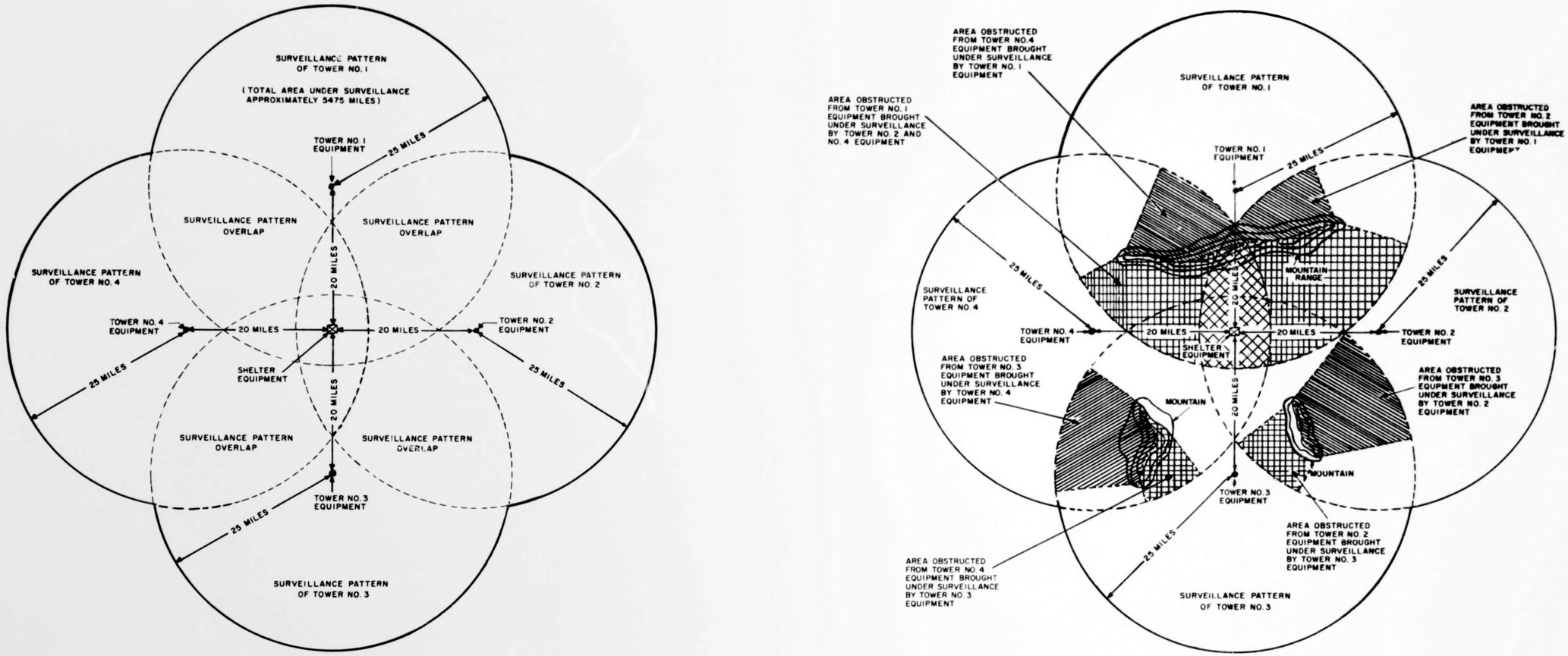
Figure 16. Dual-system diagram (system planning).


SURVEILLANCE PATTERN OF TOWER NO. 1
(TOTAL AREA UNDER SURVEILLANCE APPROXIMATELY 5475 MILES)
TOWER NO. 1 EQUIPMENT
25 MILES
SURVEILLANCE PATTERN OVERLAP
SURVEILLANCE PATTERN OVERLAP
20 MILES
SURVEILLANCE PATTERN OF TOWER NO. 4
SURVEILLANCE PATTERN OF TOWER NO. 2
TOWER NO. 4 EQUIPMENT
20 MILES
20 MILES
TOWER NO. 2 EQUIPMENT
25 MILES
SHELTER EQUIPMENT
25 MILES
20 MILES
SURVEILLANCE PATTERN OVERLAP
SURVEILLANCE PATTERN OVERLAP
TOWER NO. 3 EQUIPMENT
25 MILES
SURVEILLANCE PATTERN OF TOWER NO. 3
AREA OBSTRUCTED FROM TOWER NO. 4 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 1 EQUIPMENT
AREA OBSTRUCTED FROM TOWER NO. 1 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 2 AND NO. 4 EQUIPMENT
SURVEILLANCE PATTERN OF TOWER NO. 1
TOWER NO. 1 EQUIPMENT
25 MILES
AREA OBSTRUCTED FROM TOWER NO. 2 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 1 EQUIPMENT
MOUNTAIN RANGE
25 MILES
20 MILES
SURVEILLANCE PATTERN OF TOWER NO. 4
25 MILES
SURVEILLANCE PATTERN OF TOWER NO. 2
TOWER NO. 4 EQUIPMENT
20 MILES
20 MILES
TOWER NO. 2 EQUIPMENT
SHELTER EQUIPMENT
AREA OBSTRUCTED FROM TOWER NO. 3 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 4 EQUIPMENT
MOUNTAIN
AREA OBSTRUCTED FROM TOWER NO. 3 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 2 EQUIPMENT
MOUNTAIN
20 MILES
TOWER NO. 3 EQUIPMENT
AREA OBSTRUCTED FROM TOWER NO. 2 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 3 EQUIPMENT
25 MILES
AREA OBSTRUCTED FROM TOWER NO. 4 EQUIPMENT BROUGHT UNDER SURVEILLANCE BY TOWER NO. 3 EQUIPMENT
SURVEILLANCE PATTERN OF TOWER NO. 3

A. UNOBSTRUCTED SURVEILLANCE PATTERNS

B. MULTI-OBSTRUCTIONS IN SURVEILLANCE PATTERNS

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Figure 17. Multisystem diagram (system planning).